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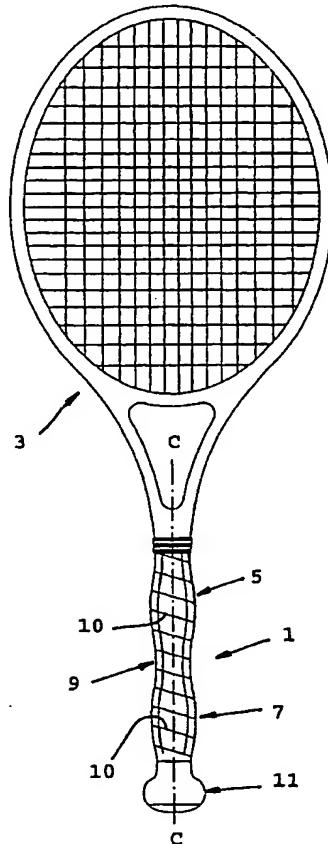
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(54) Title: RACKET SHAFT AND RACKET EQUIPPED WITH SUCH SHAFT

(57) **Abstract:** The present invention relates to a racket shaft (1) that at one end is intended to be connected to a racket head (3), said racket shaft (1) comprising a grip portion (13), said racket shaft (1) at its other end having a knob (11) that is detachably mounted on the racket shaft (1), said knob (11) having an across dimension (T) that is larger than the diameter (D) of the portion of the racket shaft (1) to which the knob (11) is attached. The invention also relates to a racket equipped with a racket shaft according to the present invention. It is significant of the invention that the grip portion (13) is equipped with two bulgings (5, 7), that the grip portion (13) is in the shape of an exchangeable part that is mounted on a core (12) of the racket shaft (1), and that the knob (11) in mounted position abuts the free end of the core (12) and constitutes a stopper of the grip portion (13).



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

RACKET SHAFT AND RACKET EQUIPPED WITH SUCH SHAFT**Technical Field of the Invention**

The present invention relates to a racket shaft that at one end is intended to be connected to a racket head, said racket shaft comprising a grip portion, said racket shaft at its other end having a knob that is detachably mounted on the racket shaft, said knob having an across dimension that is larger than the diameter of the portion of the racket shaft to which the knob is attached. The invention also relates to a racket equipped with a racket shaft according to the present invention.

**Prior Art**

From EP 0 898 988 A2 a racket shaft is previously known, said racket shaft having an exchangeable grip portion that can be mounted on and demounted from a core of the racket shaft. In order to anchor the grip portion to the core a screw is brought to cooperate with a wedge-shaped nut that is locked axially within the core.

From US-A-5,605,327 a racket shaft is previously known, said racket shaft at its free end having a butt cap that may be pushed on the free end of the racket shaft. The butt cap defines an internal cavity in which a ballast, in the shape of metal shot or metal discs, may be provided.

From each one of US-A-259,448 and US-A-4,828,261 a racket shaft is previously known that is equipped with two depressions extending around the racket shaft, said depressions being located at a distance from each other in the longitudinal direction of the shaft. The transitions between the depressions and the adjoining portions are rounded.

**Objects and Features of the Invention**

A primary object of the present invention is to present a racket shaft/racket that generally is ergonomically designed in order to give the player a better grip, control, support and balance.

Still an object of the present invention is to make certain portions of the racket shaft exchangeable.

A further object of the present invention is to provide an improved balancing of the racket shaft.

At least the primary object of the present invention is realised by means of a racket shaft/racket that has been given 5 the features of the appending independent claims.

#### **Brief Description of the Drawings**

Below an embodiment of a racket according to the present invention will be described with reference to the accompanying 10 drawings, where:

Figure 1 shows a top view of a racket according to the present invention;

Figure 2 shows a detail of the racket shaft of the racket according to figure 1;

15 Figure 3 shows a section along III-III in figure 2;

Figure 4 shows an exploded view of the racket shaft according to figure 2, said shaft being composed of a number of exchangeable parts; and

Figure 5 shows the parts of figure 4 in assembled condition, 20 where a number of sections are made in order to increase the clarity.

#### **Detailed Description of a Preferred Embodiment of the Present Invention**

25 The racket according to the present invention, shown in figure 1, comprises a racket shaft 1 and a racket head 3 that mutually are rigidly connected in such a way that the existing forces may be transferred between the racket head 3 and the racket shaft 1. Generally, the racket shaft 1 according to 30 the present invention has a new and innovative design while the racket head 3 is of a conventional design.

As seen in top view according to figures 1 and 2 the racket shaft 1 has a first thickened portion or a first bulging 5 and a second thickened portion or a second bulging 7. Between the first and second bulging 5 and 7 an intermediate portion 9 is provided, a rounded transition being present between the bulgings 5, 7 and the intermediate portion 9.

Both bulgings 5 and 7 have also a rounded wave shape in the longitudinal direction of the racket shaft 1. Both bulgings 5, 7 and the intermediate portion 9 are preferably equipped with an external grip wrap that is symbolised by the 5 oblique lines 10 in figures 1 and 2. This coating 10 is exchanged when it has been worn out.

The two bulgings 5, 7 of the shaft 1 bring about an adaption to the anatomic gripping shape of the hand. The hand has a receiving negative (concave) gripping shape. When a hand 10 grips a clod of clay of suitable size and squeezes it until a comfortable gripping thickness has been achieved, the result is an elongated body having a shape that corresponds to the bulgings 5 and 7 of the racket shaft 1. The reason why the shaft 1 is equipped with two bulgings 5, 7 is to make it 15 suitable also for a two hand grip that is practised by many players, preferably in connection with backhanders. The distance between the two bulgings 5, 7, in the longitudinal direction of the racket shaft 1, may of course vary depending on the size of the hands of the player that is gripping the 20 racket shaft 1.

The cross section of the racket shaft 1 according to the present invention is shown in figure 3 and it is evident that a core 12 has a general square shape with bevelled corners. On the exterior of the core 12 a grip portion 13 is provided, 25 said grip portion 13 on its external side having bulgings 5, 7 and the intermediate portion 9. Internally, the grip portion 13 is equipped with a layer 8, preferably of rigid plastic, and the cross section of this layer 8 is adapted to the cross section of the core 12, i.e. the layer 8 defines an internal 30 hole of the grip portion 13. The rest of the grip portion 13, i.e. the portion having the bulgings 5, 7 and the intermediate portion 9, is preferably made out of silicone rubber or foamed rubber. This is of course only an example and the user may of course choose material in the grip portion in order to achieve 35 an optimum of individual adaption.

At the lower end of the shaft 1, see figures 1 and 2, a knob 11 is attached, said knob 11 having a spherical shape in the portion that faces away from the adjacent second bulging 7.

At the end of the racket shaft 1 facing away from the racket head 3 a knob 11 is attached, said knob 11 generally having a maximum across dimension T that is essentially larger than the diameter D of the end of the shaft 1 that the knob 11 adjoins to. Preferably, the relationship between T and D is the following  $1,5D < T < 2D$ .

In figures 3 and 4 a preferred structural design of a racket shaft 1 according to the present invention is shown more in detail. Figure 3 shows the main components constituting the disclosed embodiment of the racket shaft 1 according to the present invention. Thus, the racket shaft 1 comprises a core 12, for instance manufactured from aluminium, plastic, kevlar or graphite. For manufacturing reasons it may be preferable that the core 12 and the racket head 3 are manufactured from the same material. In case the core is manufactured from aluminium it is usually hollow. This core 12 is rigidly connected to the racket head 3 in such a way that existing forces may be transferred between the racket head 3 and the core 12. The racket shaft 1 also comprises a grip portion 13 that in its turn is equipped with the two bulgings 5 and 7 and the intermediate portion 9. Preferably, the core 12 has an external out-of-round cross sectional shape and the grip portion 13 has an internal through going hole 8 having the corresponding out-of-round cross sectional shape. The reason therefore is to avoid that the grip portion 13 rotates relative to the core 12. Preferably, the cross sectional shape is octagonal.

The racket shaft 1 also comprises the knob 11 that is equipped with an externally threaded portion 14 and a detachable cap 15 that is located on a diametrically opposite side of the knob 11 relative to the threaded portion 14. The cap 15 is connected to the rest of the knob 11 by means of a thread coupling, the rest of the knob 11 being hollow, see figure 4.

In Fig 4 it is shown how the components according to figure 3 are assembled in order to create a racket shaft 1 according to the present invention. The grip portion 13 is pushed on the core 12 and the knob 11 is mounted on the free end of the core 12. The detachable mounting of the knob 11 is

effected by having the externally threaded portion 14 to cooperate with an internally threaded hole 16 in the core 12. A suitable tightening of the knob 11 effects a proper anchoring of the knob 11 on the free end of the core 12.

As is evident from figure 4 the hollow knob 11 is filled with lead pellets 17 that gives the possibility to affect the weight distribution of the racket according to the present invention.

By having certain of the components, included in the racket shaft 1, detachably mounted on the core 12 the possibility is offered that components of different sizes, i.e. grip portions 13 and knobs 11, may be mounted on the core 12. As regards different sizes of the grip portion 13 it is basically the question of different maximum diameters of the bulgings 5, 7 and also the mutual distance between the bulgings 5, 7. As regards the knobs 11 different sizes normally means different across dimensions T.

Especially as regards the grip portion 13 the possibility to detach also means that grip portions 13 manufactured from different materials may be used, this further emphasising the possibility to individual adaption. As regards different materials of the grip portion 13 soft silicone-like rubber, more rigid foamed rubber or a combination of different plastics may be mentioned in an exemplifying and non-restricting purpose. It is also possible that the material used for the grip portion 13 is inherently vibration damping or that vibration damping inlays are locally attached between the core 12 and the grip portion 13.

The grip portion 13 may also have different surface patterns, e.g. grooving, projecting pimples, recessed holes, wave-like embossing. Taken together, proper choice of material and proper surface pattern gives a compact contact with the hand as well as proper absorption of existing sweat. The material and the surface pattern bring about an airiness that enables cooling of the hand and a natural dryout of excessive sweating of the hand.

In this connection it should be mentioned that in certain circumstances it is possible that the grip wrap 10 on

the grip portion 13 is deleted and it is also possible that the entire grip portion 13 is exchanged when it is worn out.

As is evident from figure 4 both the grip portion 13 and the knob 11 are detachably attached to the core 12. This structural design offers a unique possibility to the individual player to custom-make his/her own racket, i.e. he/she may choose the grip portion 13 that is individually adapted as regards both dimensions, material choice and surface structure. Also regarding the knob 11 the player may choose a suitable dimension and through the hollowness of the knob 11, via the filling degree of lead pellets 17 in the hollow knob 11, affect the weight distribution of the racket according the present invention.

The knob 11, attached to the free end of the core 12, brings about that the hand is given a distinct support at the free end of the shaft portion 1. This brings about a natural prevention against dropping the racket, i.e. it is in principle not possible for the racket to slide out of the hand. Besides the knob 11 increases the contact surface between the shaft portion 1 and the hand of the player.

The knob 11 also brings about other functional benefits when using the racket according to the present invention. In tennis it is a distinct benefit for the player to have a large reach in his/her motions and to have a high point of impact relative to the court of the opponent. This is especially important in connection with the serve. Thereby, the knob 11 somewhat increases the length of the racket shaft 1, compared to a conventional racket shaft, since the grip fully or partly may be located to the knob 11. This is of especial importance in connection with the serve and when returning balls close to the sidelines.

When the player fully or partly has his/her grip on the knob 11 the hand and the wrist may more easily rotate relative to the racket shaft 1, this being an obvious benefit when the player wishes to hit balls with a distinct top spin. In connection with the serve a harder, more flat serve is achieved, compared to a traditional grip, since the hand partly rotates relative to the knob 11 during the final phase of the serve.

**Feasible Modifications of the Invention**

In the embodiment described above it has been stated that the internal through going hole of the grip portion 13 and the core 12 have cross sections corresponding to each other. However, within the scope of the present invention it is also feasible that the grip portion 13 is designed from such a flexible material that the internal through going hole of the grip portion 13 adapts to the external shape of the core 12 when the grip portion 13 is mounted on the core 12, this preferably being done by pushing the grip portion 13 on the core 12. Also in this case it is avoided that the grip portion 13 rotates relative to the core 12.

In the embodiment described above the racket shaft 1 comprises a number of exchangeable components. However, within the scope of the present invention it is feasible that the racket shaft is not equipped with exchangeable components but the components of the racket shaft being permanently connected to each other.

The invention is primarily initiated for tennis rackets. However, the principles of the present invention may also be applied in connection with rackets for other sports and in exemplifying end non-restricting purpose squash and badminton may be mentioned. Of course, there will normally be a certain adaption to the sport in question when producing a racket /a racket shaft according to the present invention.

**Claims**

1. Racket shaft (1) that at one end is intended to be connected to a racket head (3), said racket shaft (1)  
5 comprising a grip portion (13), said racket shaft (1) at its other end having a knob (11) that is detachably mounted on the racket shaft (1), said knob (11) having an across dimension (T) that is larger than the diameter (D) of the portion of the racket shaft (1) to which the knob (11) is attached,  
10 characterized in that the grip portion (13) is equipped with two bulgings (5, 7), that the grip portion (13) is in the shape of an exchangeable part that is mounted on a core (12) of the racket shaft (1), and that the knob (11) in mounted position abuts the free end of the core (12) and  
15 constitutes a stopper of the grip portion (13).

2. Racket shaft (1) according to claim 1,  
characterized in that the knob (11) is partly spherical.

20 3. Racket shaft (1) according to claim 1 or 2,  
characterized in that the knob (11) has an externally threaded portion (14), that the core (12) has an internally threaded hole (16), in which the externally  
25 threaded portion (14) is intended to be received.

4. Racket shaft (1) according to any of the previous claims,  
characterized in that the core (12) has an externally out-of-round cross sectional shape, and that an  
30 internal hole (8) of the grip portion (13) has a corresponding out-of-round cross sectional shape.

35 5. Racket shaft (1) according to claim 4,  
characterized in that the cross sectional shape is octagonal.

6. Racket that comprises a racket shaft (1) and a racket head (3), said racket shaft (1) comprising a grip portion (13), and that the racket shaft (1) has an knob (11) at its end facing

away from the racket head (3), said knob (11) being detachably mounted on the racket shaft (1), said knob (11) having an across dimension (T) that is larger than the diameter (D) of the portion of the racket shaft (1) that the knob (11) is  
5 attached to, characterized in that the grip portion (13) is equipped with two bulgings (5, 7), that the grip portion (13) is designed as an exchangeable part, that is mounted on a core (12) of the racket shaft (1), and that the knob (11) in mounted position abuts the end of the racket  
10 shaft (1) that constitutes stopper of the grip portion (13).

7. Racket according to claim 6, characterized in that the knob (11) is partly spherical.

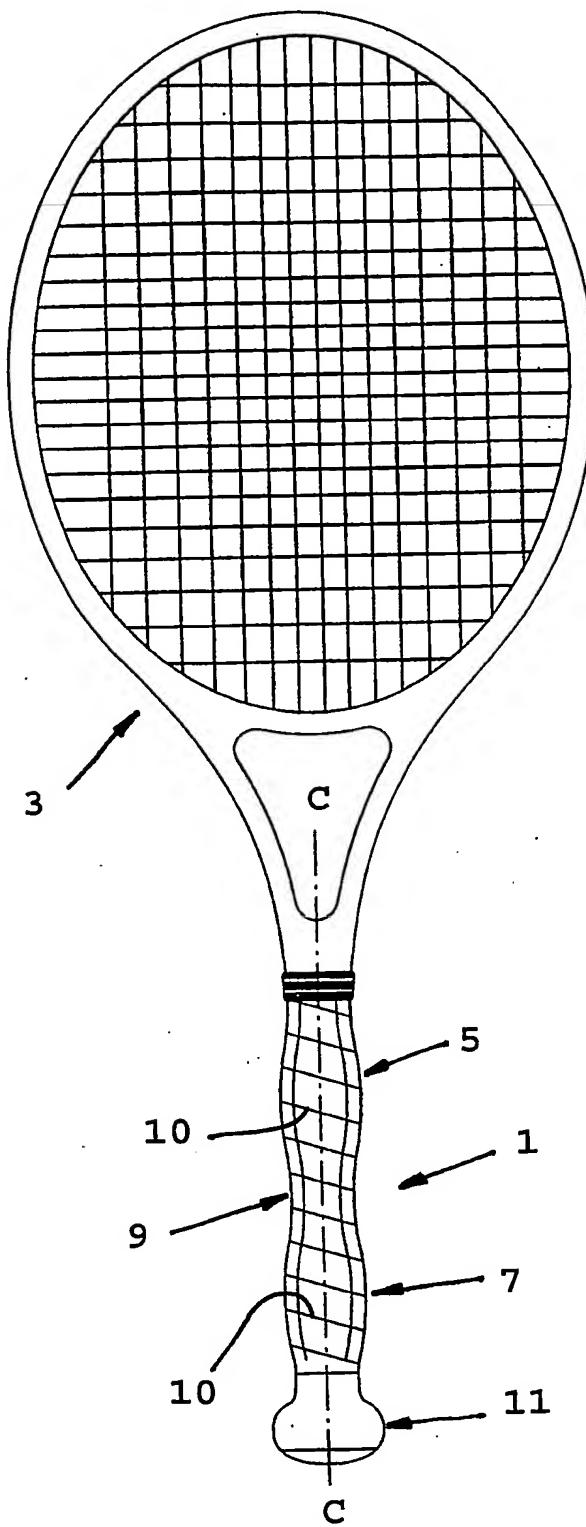
15 8. Racket according to claim 6 or 7, characterized in that the knob (11) has an externally threaded portion (14), that the core (12) has an internally threaded hole (16), in which the externally threaded portion (14) is intended to be received.

20 9. Racket according to any of claims 6-8, characterized in that the core (12) has an externally out-of-round cross sectional shape, and that an internal hole (8) of the grip portion (13) has a corresponding out-of-round cross sectional shape.  
25

10. Racket according to claim 9, characterized in that the cross sectional shape is octagonal.

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Fig 1



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Fig 2

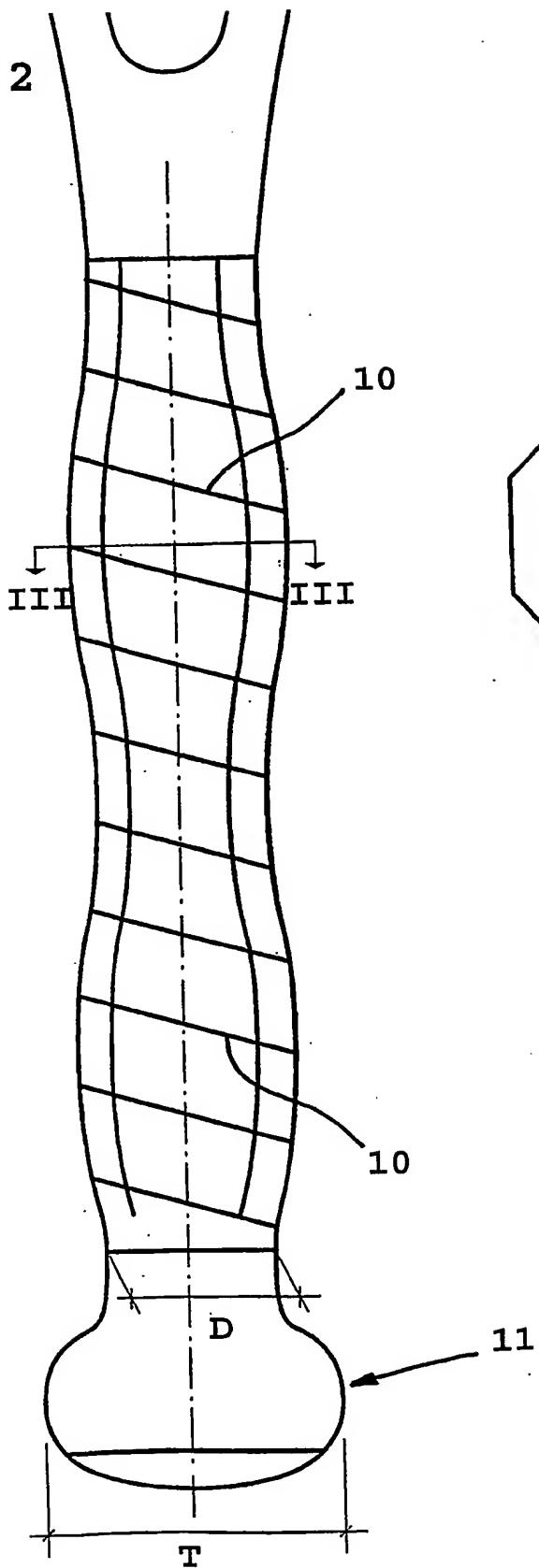
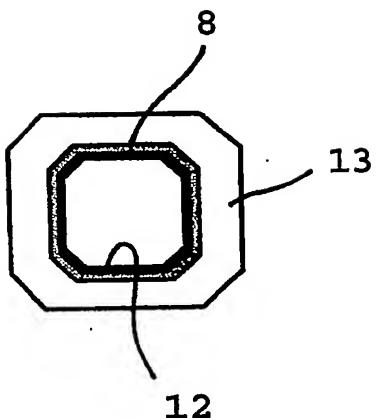
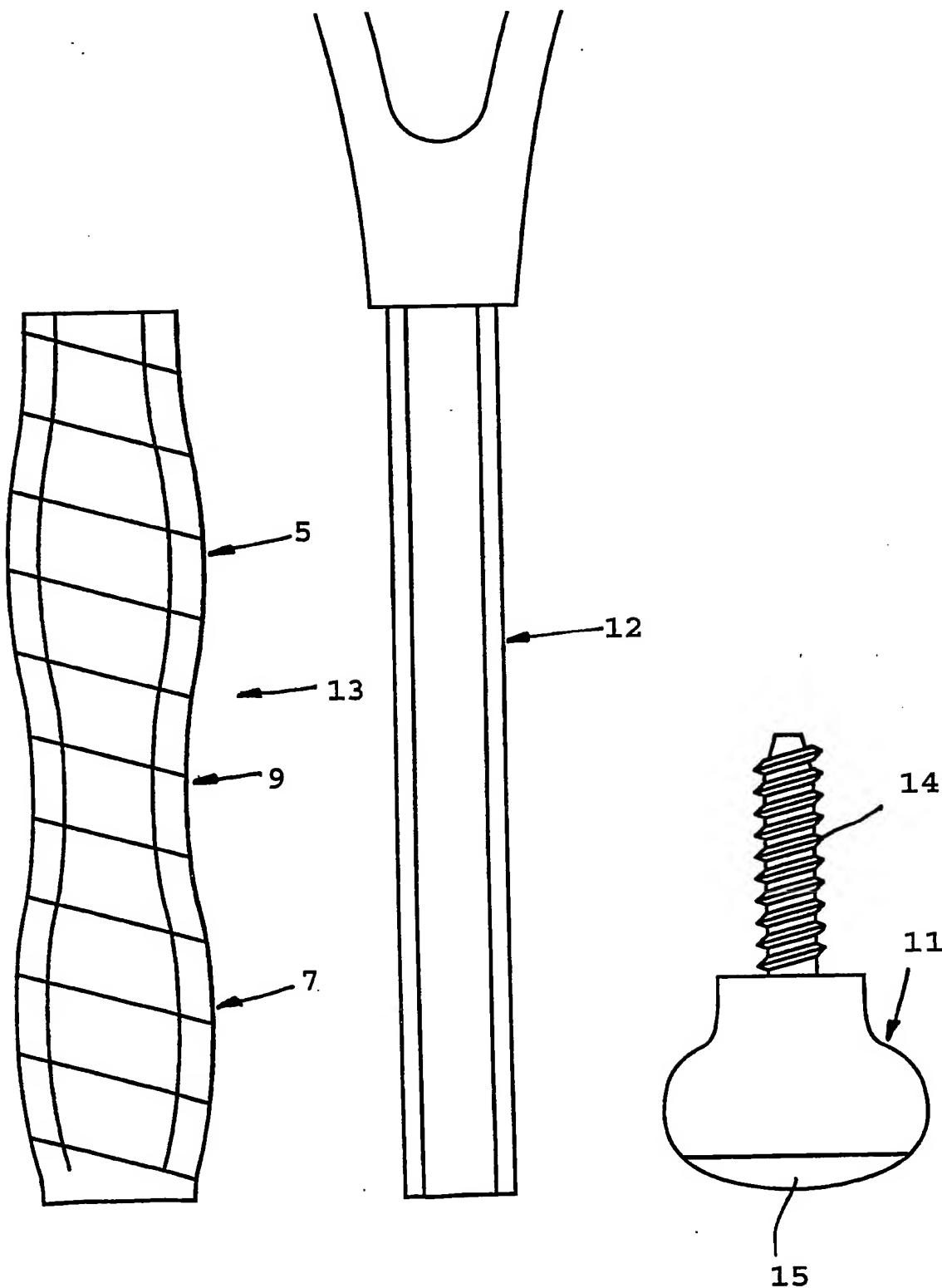


Fig 3



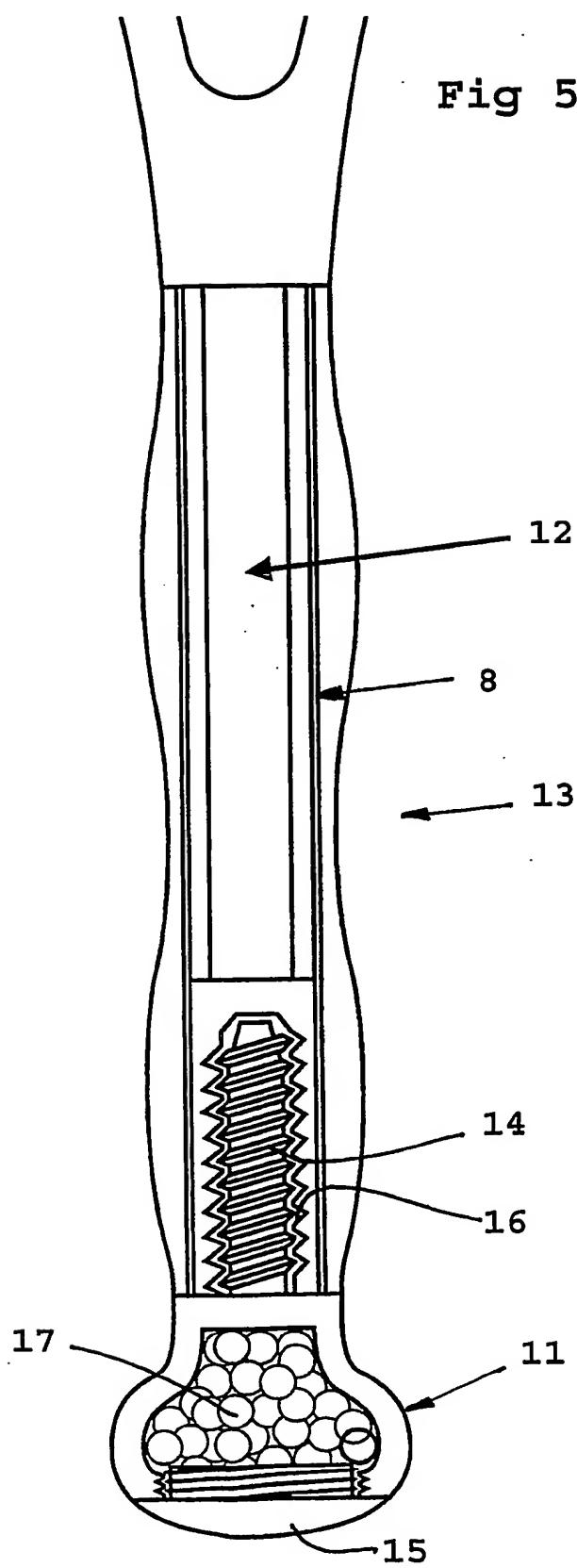
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Fig 4



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Fig 5



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 03/01553

## A. CLASSIFICATION OF SUBJECT MATTER

**IPC7: A63B 49/08**

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**IPC7: A63B**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**SE,DK,FI,NO classes as above**

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-INTERNAL, WPI DATA, PAJ**

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5605327 A (W.H. MCUTCHEN), 25 February 1997 (25.02.97), figure 2a, abstract --	1-10
A	US 6159115 A (Y.-C. HSU), 12 December 2000 (12.12.00), figure 2, abstract --	1-10
A	EP 0898988 A2 (DUNLOP SLAZENGER GROUP LIMITED), 3 March 1999 (03.03.99), figure 2, abstract --	1-10
A	US 4828261 A (H. KLEYLEIN), 9 May 1989 (09.05.89), figures; abstract -----	1-10

 Further documents are listed in the continuation of Box C. See patent family annex.

- \* Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

06/09/03

International application No.  
**PCT/SE 03/01553**

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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